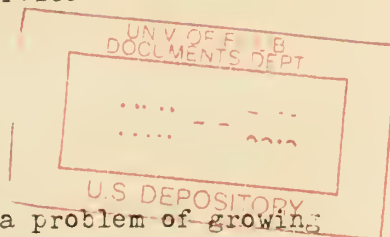


USES FOR SAWDUST AND SHAVINGS

By

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The most economical disposal of sawdust and shavings is a problem of growing concern to the wood industries. In some cases the problem arises from the need of reducing the cost of getting rid of material that clogs production; in others, from the desire to get some return or profit from material that in the log form has represented a considerable outlay of money. Steam-power plants that used wood waste for fuel at the point of its production have been replaced to a large extent by plants that use electric power or internal-combustion engines, so that many of these major outlets for sawdust as fuel have been closed. On the other hand, certain uses for sawdust and shavings have been extended. Thus, from various angles, the subject has considerable current interest for wood-working concerns.

This report summarizes the best available information on uses for sawdust and shavings in order to facilitate reply to the large number of inquiries received by the Forest Products Laboratory. On some of the uses the information at hand is reasonably dependable; on others, where the use is small and localized, the information is fragmentary and may not be currently applicable elsewhere or under other conditions.

Major emphasis in this report is placed upon the established uses rather than upon potential uses. Potential uses will seem much more important to many inquirers, but for the most part such uses are a matter for further research and investigation. This report aims to cover normal trade outlets and makes no attempt to report on the status or results of research projects.

Quantity uses for sawdust and shavings are open to the individual producers of such waste. Many of the uses, however, do not require large quantities. Many of them call for the retailing of special qualities of material and often of material in relatively small lots, the demands for which are customarily supplied by dealers who specialize in sawdust and shavings. Most of the larger cities have such dealers, whose names are carried in classified directories and similar lists.

On an industry-wide basis the bulk of the sawdust is green. Thus far it has not been considered economically feasible to dry sawdust artificially. Green sawdust has limited use except as fuel at the producing plant. Green hardwood sawdust, however, is used in fairly large amounts for meat smoking. In certain

¹Maintained at Madison 5, Wis., in cooperation with the University of Wisconsin.

localities green softwood sawdust, and to a less extent hardwood sawdust, is used in special sawdust furnaces for domestic heating. Shavings ordinarily come from air-dried or kiln-dried wood. Shavings and sawdust produced from machining dry wood afford their producer the best prospects for marketing waste material of this kind. For most uses only fresh material is acceptable. Sawdust and shavings, when exposed to the weather, very rapidly deteriorate and lose much of their use value.

As in other fields of wood use, it is better to prevent the waste or to minimize its occurrence than to salvage it after it occurs. After waste is produced, however, its most economical disposal depends more upon the initiative and selling ability of the producer than upon almost anything else.

Available information is tabulated in tables 1, 2, 3, and 4 of this report under the following four general classifications:

- (1) Uses because of special physical qualities.
- (2) Fuel uses.
- (3) Fiber uses.
- (4) Chemical uses.

Such classification is not entirely satisfactory because some uses may be classed in more than one group.

In seeking a market, it is well to recognize that intrinsic physical qualities (table 1) of sawdust and shavings, as well as their cheapness and availability, govern certain types of their use. Recognition of this may help the producer to find local markets not specifically listed in table 1. Sawdust and shavings sometimes are chosen for use because they are: (1) absorbent, as for spilled liquids, as a carrier of liquid manure; (2) abrasive, as in hand soaps, metal polishes, fur cleaning, sweeping compounds (absorbence also involved); (3) bulky and fibrous, as for wood flour, cushioning, packaging, light-weight cement aggregate; (4) nonconductive, as for insulation, ice storage; and (5) granular, as for textured surfaces, oatmeal wallpaper.

Four main classes of fuel uses (table 2) for sawdust and shavings are recognized: (1) for power and heat at the producing plant (with other wood waste); (2) in public buildings and power plants (with hogged waste); (3) with special domestic sawdust burners (sawdust only); and (4) as briquettes (dry sawdust and shavings). The first class is country-wide and large in volume, although decreasing. The last three classes are of special significance, mostly in the Pacific Northwest. The fourth class is arousing increasing interest, from which applications of this use in other parts of the country may develop.

Uses of sawdust and shavings as fiber (table 3) have received considerable attention, but as yet have not actually developed to any important degree. Sawdust and shavings are not a generally acceptable material for pulping, because of various technical and economic factors involved in their use for such purpose. Wood flour, an important use, is fibrous, but it is classified in this report under uses for special physical properties. In certain cases, use is being made or has been tried for three types of fiber product,

namely; (1) filler for saturating felt, asphalt shingles, and the like; (2) low-grade pulp for container liners; and (3) pressed board or shaped products with resin or other binding agent.

In the United States uses of sawdust and shavings for production of chemicals (table 4) are of potential rather than immediate importance, except for their time-honored usage in connection with the smoking of meat. Established chemical-conversion processes are employed to some extent for products of (1) distillation and (2) extraction; while laboratory or commercial pilot-plant tests are in progress for chemical production by (3) hydrolysis, (4) fermentation, and (5) hydrogenation.

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Table 1. -- Uses of sawdust and shavings because of special physical qualities

Use	Sawdust	Shavings	Species	Specifications	Users or purchasers	Market location	Economical shipping distance	Annual consumption	Remarks
FOR ABSORBENT QUALITIES:									
<u>Bedding</u>									
Stable	Dry	Dry	White pine, basswood, Ponderosa pine, and other softwoods and hardwoods	Soft absorbent, non-resinous woods preferred. Woods containing tannins not desired	Chiefly farmers and dairies	Country-wide		Large	Use subject to expansion to utilize valuable liquid stable manure commonly lost
Kennels		Dry	Eastern redcedar	Dry shavings	Sawdust dealers			Small	
<u>Floor Covering</u>									
Factories	Principally dry sawdust used. Some shavings accepted		"Box Shop," a mixture of hardwoods and softwoods as produced at box factories, furniture factories, and other woodworking plants	Dry, nonresinous, lightweight species preferred	Purchased through sawdust dealers or directly from producer	Many urban centers		Relatively large	Absorbents are the greatest single outlets for dry sawdust. Green sawdust should be acceptable in some cases
Flint markets									
Garages									
Hotel kitchens									
Machine shops									
Meat markets									
Packing plants									
Tanneries									
Taverns									
Vegetable markets									
Warehouses									
<u>Grasshopper Bait</u>	Green, Dry		Ponderosa pine, cottonwood	Weathered pine (2 years), green or dry cottonwood	Government and local authorities	Northern Plains States	500 miles or less	Small	Poisoned with arsenic. Used only in critical years
<u>Leather Working</u>	Dry		White pine or other light-weight, light-colored nonstaining woods	Soft, clean, non-staining species	Tanneries				
<u>Malon Soil Conditioner</u>	Green, Dry	Dry	Mixed		Farmers and mureorymen	Rural areas		Small	Has limited use except as combined with and as a carrier of fertilizing matter
<u>Signal Rockets and Fireworks</u>	Dry			Sifted, fine, for impregnating with chemicals					
<u>Sound Dressing and Special-Purpose Hospital Mattresses</u>	Dry		White pine and other woods	Clean, sifted, sterile					For special use only. Extent probably very limited
FOR ABRASIVE QUALITIES:									
<u>Cleansing Soaps</u>	Dry			Screened to 35 mesh	Specialty manufacturers			Small	
<u>Floor Sweeping Compounds</u>									
Commercial	Dry		Hardwood and softwood	Dry stock sifted to 16 to 20 mesh or finer. Light-colored, lightweight woods preferred	Made and distributed by numerous oil, chemical, and janitor supply companies for use in schools, stores, office buildings, and the like	Many urban centers	Up to about 300 miles	Moderate amounts	Green sawdust used in some type now being tried
Household	Green		Any species		Householders	Country-wide		Small	As a dust retardant for sweeping basement floors, as a material for sprinkling on icy steps domestic outlets are small but numerous lots are possible
<u>Fur Working</u>	Dry		Kiln-dried sugar maple, a little birch, and a small amount of softwood	40 mesh maple (clean), 16 to 35 mesh for dressing and dyeing	The fur manufacturing trade concentrated in New York City; also numerous cleaners elsewhere. Users usually supplied by sawdust dealers	Dressing and dyeing industry, chiefly in New York City; cleaners in all cities	1,000 to 2,000 miles	Moderate amounts	Stock coming largely from maple-flooring plants
<u>Metal Finishing</u>	Dry	Dry	For cleaning, drying, and polishing plated dry hard maple lb ware, kiln-dried sugar maple is preferred. For other cleaning and drying, light soft woods are desirable. Species of high tannin, resin, or acid content not acceptable	Platers' sawdust is mesh and finer, white; sugar maple is pre-finer. Often screened to get uniform size and free of chips	Sawdust dealers	Industrial centers	Usually supplied from local plants	Moderate amounts	Used chiefly in tumbling drums
<u>Poultry Litter</u>	Dry		Light-weight species	Sifted, fine					Believed to be only occasional use
<u>Synthetic Abrasives</u>									
Carborundum	Green				Manufacturers of abrasives	Eastern cities New York, New England, Niagara Falls		Small	

Table 1.—Uses of sawdust and shavings because of special physical qualities (Continued)

Use	Sawdust	Shavings	Species	Specifications	Users or purchasers	Market location	Economical: shipping distance	Annual consumption	Remarks
FOR BULK QUALITIES:									
Circus Rings and Riding Stables	Green:Dry	Dry:Mixed			Regular dealers and riding stables	Circus towns		Medium	
Clay Products—Special	Green:Dry		Species not important	Often sifted for uniform size	Specialty manufacturers				Relatively small for reducing density and weight
Porous brick and tile									
Composition Flooring	Dry	Dry:Hardwood or mixed hardwood and softwood		Varied, usually dry, soft species, non-staining, nonacid, to 50 percent as filler. Coarse softwood base. Fine hardwood top. Usually sifted for size	Limited commercial experimentation			Small	Used with various cements to give insulating and resilient properties
Molded Novelties	Dry	Dry:Light-weight hardwoods and softwoods		Dry stock, ground to proper fineness. Must be clean	Small novelty producers			Small	Plaques, novelty jewelry cases, furniture ornaments, and the like
Packing									
Glass, china, canned and bottled goods. Metal ware	Dry		Various species, but low density preferred	Nonstainic or acidic metal ware. Light-colored, light-weight, soft, absorbent stock preferred. All stock dry and clean	Shippers of liquids, glass, china, and other fragile items	Widely dispersed		Moderate	
Building stone			Dry:White pine, basswood, ponderosa pine	Light-colored, light-weight, nonstaining stock	Shippers of building stone	Indiana, New York, and other quarrying regions			Packed between finished stones on flat cars, and the like
Grapes	Dry		Spruce, Douglas-fir, white fir	Cubical stock, air-dried, clean, sifted	California grape growers	Central and southern California		Few thousand tons	Often made specially by cutting
Nursery stock			Dry:Cedar, white pine, ponderosa pine, basswood	Soft, absorbent woods, chiefly shavings and shingle tops	Nurseries	Country-wide			Packing about roots of plants, shrubs, and the like, in shipping
Plaster Board	Dry		Dry:White pine, ponderosa pine and other light-colored, light-weight woods	Medium-coarse stock of species listed. Must be nonstaining and nonacid	Certain plants making plaster board			Several thousand tons	Usual mix 4 to 5 percent by weight, is being replaced by foaming compounds
Sawdust-Cement Concrete Poured	Green:Dry		Permissible species not definitely established. Spruce, Norway pine, jack pine, and aspen reported satisfactory. Leached stock of other species may be cement satisfactory. Woods said to be avoided: cottonwood, oak, birch, maple, Douglas-fir, western redcedar	Large, coarse, hard particles of woods having no detrimental extractives. (Extractive content is a factor affecting setting of the cement)	Scattered building contractors				Not widely used, but sometimes advocated for cow and poultry barn floors
Cast blocks and panels	Green:Dry		Same as above	Same as above					Precast to panels or blocks for easy handling and to avoid cracking and warping in setting. Includes certain patented formulas and special trade names
Stuffing Toys	Dry		Light-weight hardwoods and softwoods	Dry stock; fine mesh; any mixture except highly resinous woods	Doll manufacturers	Chiefly New York City	From local supplies	Small	
Wood Flour									
Special types	Green:Green		Southern yellow pine		Some manufacturers	A few		Relatively small	
For burn-out mesh in ceramics					of firebrick and ceramics	limited locations			
Usual types	Dry		Dry:White pine, ponderosa pine, Douglas-fir, maple, aspen, birch, larch, hemlock	Dry stock (9 percent moisture content and higher); softwood preferred; any size; Southern pine if low in resin	Specialized plants isolating waste from planing mills, box factories, millwork	Scattered in different sections in miles	Up to approximately 300 tons	Approximately 300 tons	Gradually increasing use in manufacture of linoleum, plastics, and the like
FOR NONCONDUCTIVE QUALITIES:									
Concrete Protection	Green	Dry:Mixed		Nonstaining species	Building contractors			Small	Coverage to prevent too rapid drying
Insulation	Dry	Dry:All species		Dry sawdust and shavings; any kind, but light weight and light color (clean) preferred	Builders and operators of use items			Moderate	Used formerly more than now. Possibilities probably not fully exploited
Building									
Ica houses									
Refrigerator cars									
Sound									
Water pipes									
FOR GRANULAR QUALITIES:									
Display-Window Decoration	Dry		Mostly especially cut; light color	Suitable for dyeing or staining to different colors		Urban stores		Small	
Texturing Outmeal Wallpaper	Dry			Screened for size	Specialty paper manufacturers			Probably small	

Table 2.--Fuel uses of sawdust and shavings

Use	Sawdust	Shavings	Species	Specifications	Users or purchasers	Market location	Economical: shipping distance	Annual consumption	Remarks
<u>Briquettes</u>	: Dry:	: Dry:	: Principally softwood species	: Stock must be of low moisture content, 9 percent or less	: Special briquetting plants where several are available per day	: At present: Local	: Local	: 200,000 tons	: Only one process now known to be used (Pres-to-logs). A process for small briquettes and for small scale production is under development
<u>Domestic Fuel</u>	: Green:	: Green:	: Chiefly Douglas-fir:	: Coarse head-saw sawdust; no shavings or weathered material	: Residents in producing area	: Chiefly in: Local Northwest; some in Northeast	: Local	: 600,000 tons	: Some chance for expansion in East where sawdust supply is constant and plentiful
<u>Fire Lighters</u>	: Dry:	: Dry:	: Any	: Shavings sprinkled with crankcase oil; stored outdoors in covered metal containers; few handfulls wrapped in newspaper for use as steady burning kindling, particularly for fireplace fuel	: Any householder	: Country-wide	: Country-wide	: Very small	: Practiced by few but worthy of wider adoption
<u>Specialty</u>	: Dry:	: Dry:	: Any	: Dry stock required	: Current use doubtful			: Very small	: Reported formerly pressed into rosin and pitch cakes
<u>Gas Producers</u>	: Green:	: Green:	: Any	: No current demand					: Has been used for domestic cooking and for truck fuel
<u>Industrial Fuel</u>	: Green:	: Green:	: Dry: All	: Any size and moisture content	: Originating and nearby plants	: Country-wide except utilities	: Local	: Large	: Usually with Dutch ovens or special feeds
<u>Lime Burning</u>	: Dry:	: Dry:	: Any; pine preferred	: Dry shavings	: Burners near source of shavings	: Local			: Loose shavings delivered by truck

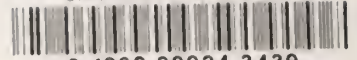
Table 3.--Fiber uses of sawdust and shavings

Use	Sawdust	Shavings	Species	Specifications	Users or purchasers	Annual consumption	Remarks
<u>Container Board Pulp</u>	:Green:Dry:	:	:Pine	:Head-saw sawdust, green	:Probably none in normal times	:	:A war measure; about 25 percent put in digester for making low grade liner
<u>Paper Pulp</u>	:Green:Dry:Green:Dry:	:Softwoods	:	:Not known	:Probably none in normal times	:	:It is reported that one pulp mill has used 50 percent sawdust in one digester
<u>Pressed Board or Core Stock</u>	:Green:Dry:Green:Dry:	:Unimportant	:	:No exact specifications, but light-colored, lightweight woods preferred	:To be made at source of raw materials	:Negligible	:Various groups now working on molded sawdust and shavings. Products - none yet commercially important
<u>Saturating Felt (Asphalt roofing)</u>	:Green:Dry:	:	:Not specified	:Screened or fine sawdust	:Some saturating felt manufacturers	:Moderate amount	:As filler in asphalt roofing

Table 4.--Chemical uses of sawdust and shavings

Use	Sawdust	Shavings	Species	Specifications	Users or purchasers	Market location	Annual consumption	Remarks
<u>Distillation Cedar oils</u>	:Green:Dry:Green:Dry:	:Mexican cedar, Eastern redcedar	:	:Heart stock. Ground to wood-flour mesh	:Ten plants in Southern States	:Most plants located in Tennessee	:	:
<u>Destructive</u>	:Dry:	:Softwoods and hardwoods	:	:	:A few chemical plants	:Midwest and West	:Negligible	:A wartime outlet; otherwise largely experimental
<u>Steam Turpentines</u>	:Green:Dry:	:Longleaf pine	:	:Wood with high resin content	:None at present	:	:	:Commercial production discontinued
<u>Dyes</u>	:Green:Dry:Green:Dry:	:Osage-orange, sumac	:	:Heart stock	:Not known	:	:	:Little current importance
<u>Ethyl Alcohol</u>	:Green:Dry:Green:Dry:	:Various species	:	:Softwood stock for highest yields	:	:	:	:One pilot plant now in commercial operation
<u>Fodder Yeast</u>	:Green:Dry:Green:Dry:	:Any softwoods, hardwoods	:	:Mixed with hogged mill waste	:At present experimental only	:	:	:Pilot plant in operation
<u>Lignin Plastic</u>	:Dry:	:Hardwood, especially maple	:	:Dry. Stock containing no bark	:	:	:	:Industrial applications not developed
<u>Meat and Fish Smoking</u>	:Green:Dry:	:Hardwoods, chiefly hickory, maple, birch, beech, oak, walnut, gum	:	:Green or dry. Chiefly head-saw stock. Factory stock also used	:Meat packing plants	:Country-wide	:About 30,000 tons	:Softwoods not desirable. Merits of various hardwood species somewhat controversial
<u>Wood Sugars and Molasses</u>	:Green:Dry:Green:Dry:	:Various species	:	:Few special requirements	:	:	:	:One pilot plant now in operation

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